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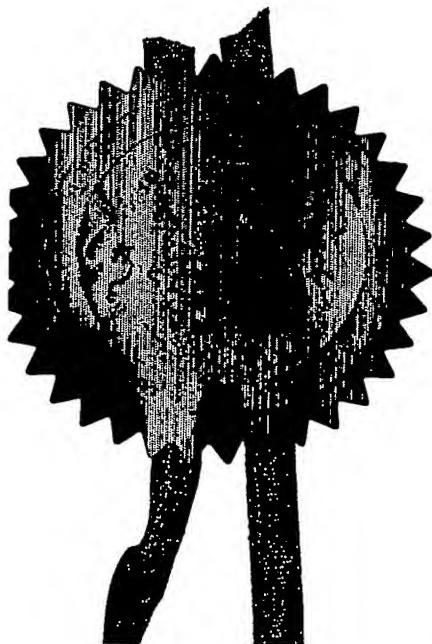
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GB 0323794.8

By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of:

BEAUTY SOURCE LTD,  
Hawthornden,  
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Incorporated in the United Kingdom,

[ADP No. 08822744001]

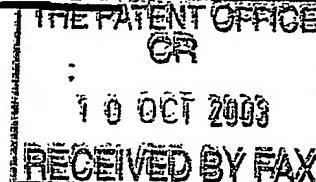
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10 OCT 2003

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## 1. Your reference

IMAC / P29392GB

2. Patent application number  
(The Patent Office will fill in this part)

0323794.8

10 OCT 03 E843785-2 D02866  
P01/7700 0.00-0323794.8

## 3. Full name, address and postcode of the or of each applicant (underline all surnames)

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*1977 ACT APPLICATION FILED 5/2/04*

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

G  
F177  
5/2/04

08730913001

## 4. Title of the invention

TANNING BOOTH

## 5. Name of your agent (if you have one)

ERIC POTTER CLARKSON  
PARK VIEW HOUSE  
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Patents ADP number (if you know it)

1305010 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)Date of filing  
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

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- a) any applicant named in part 3 is not an inventor; or
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Description 30 ✓

Claims(s) 6 ✓

Abstract 1 ✓

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Priority Documents 0

Translations of priority documents 0

Statement of inventorship and right to grant of a patent (Patents Form 7/77) NO

Request for preliminary examination and search (Patents Form 9/77) NO

Request for substantive examination (Patents Form 10/77) NO

Any other documents  
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature ERIC POTTER CLARKSON  
ERIC POTTER CLARKSON

Date  
10 October 2003

12. Name and daytime telephone number of person to contact in the United Kingdom

0115 9552211

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## TANNING BOOTH

This invention relates to a booth in which a person may have a product such  
5 as a cosmetic product applied to her skin. The invention relates particularly  
to a tanning booth in which a person positioned within the booth may have a  
sunless tanning lotion applied to her skin.

Recently public awareness of the harmful side effects of the sun's rays has  
10 become higher. It is well known that too much exposure to the sun can lead  
to skin cancer. Because of this risk, the popularity of cosmetic products  
which provide a "sunless" tan has increased significantly over recent years.

Existing sunless tanning lotions are often in the form of creams or lotions  
15 that may be self applied to the skin. A problem with such creams and  
lotions is that it is very difficult to ensure an even tan since the tan often is  
not visible until sometime after the cream or lotion has been applied to the  
skin.

20 It is also known to have such creams and products applied by a beautician.  
The advantage of this method is that a more even tan is usually achieved.

More recently it has been known to apply a sunless tanning lotion to the  
skin of a person with an air brush. This known method involves a beautician  
25 or other operator applying a sunless tanning lotion to a client using an air  
brush to spray the sunless tanning product over the skin of the client to  
achieve an even coverage over the skin.

A problem with this existing method is that although tanning products are  
30 not harmful when inhaled by beauticians applying the product to clients,

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beauticians may be exposed over significant periods of time to particles of sunless tanning lotion which may "hang" in the atmosphere during and after the air brushing process. In addition, a client to which the product is applied is often surrounded by a mist of the tanning product during and after the spraying process and so may inhale a significant quantity of the product during the tanning process. This can cause discomfort.

5 According to a first aspect of the present invention there is provided a booth for accommodating a person, the booth defining a booth volume and  
10 comprising:

a base portion and a top portion;  
flow means for causing a downward air flow within the booth; and  
projecting means for projecting a product into at least some of the  
booth volume within the booth and, in use, onto a body of a person  
15 positioned in the booth, and control means for controlling the projection of  
the product.

The booth is adapted to accommodate a person requiring a product to be applied to her skin. The downward air flow within the booth means that the  
20 product projected within the booth and therefore onto the body of a person positioned within the booth is carried downwards in the air flow. This means that fewer particles of the product remain in the atmosphere and therefore fewer particles will be inhaled by the person receiving the tan.

25 Because the booth according to the first aspect of the invention comprises control means for controlling the projection of the product, it is not necessary for an operator to administer the product, or control the projection means. This reduces, or eliminates an operator's exposure to the product.

Advantageously, the control means controls the projection of the product according to parameters of the body of the person positioned in the booth.

People using a booth according to the invention will fall within a range of  
5 heights. In general, therefore, the booth of the invention is adapted to accommodate a body having a height of up to 6' 4" (1.94 m) and down to a minimum of 0.85 m. Theoretically there is not a minimum height, although practicably one cannot spray a client if their height is zero. Preferably, however a minimum height of 850mm is created in order that if the sensor  
10 has not picked up anything by this height, it indicates to the system that there has been a malfunction with the sensing operation and therefore causes the system to reset.

In prior art booths, the amount of product projected onto a body within the  
15 booth would be the same regardless of the height of the body standing in the booth at any given time. This means that, in order to ensure that sufficient product is projected onto a person of maximum height, all people using the booth will have a maximum amount of product projected onto them. Because prior art booths are designed to cater for the largest body size  
20 which can be handled, consumption of the product is correspondingly unnecessarily high.

By means of the present invention, because the projection of the product is controlled in accordance with parameters of the body in the booth, product  
25 consumption can be tailored to suit each person's height thus reducing or eliminating wastage of product on shorter clients.

Advantageously, the control means comprises a sensor for sensing a parameter of the body. Preferably, the sensor senses the height of the body.

Although all human bodies are broadly of the similar shape, each body displays a set of unique nuances in shape and size. As mentioned herein above, this can cause problems with automating spraying or projecting of a product onto a human body.

5

By means of the sensor therefore, relevant data from a body accommodated in the booth can be gathered. The data can then be used by the control means to vary the projection of the product to accommodate features of the body accommodated within the booth.

10

The projection of the product can be varied in accordance with the exact size and shape of each human body accommodated in the booth. However, a control means adapted to respond in this way to each different body accommodated in the booth would be time consuming to develop and therefore expensive.

15

The inventors have realised that in respect of the present invention, the most important parameter of a human body is the height of that body. Little if any further parameters are required in order to obtain sufficient data for the control means to effectively control the projection of the product. Other features of the body can be deduced by calculating the position of these features based on a percentage of the body's height. These percentages are based on mean averages of data taken from a large number of bodies.

20

Conveniently, the booth comprises a plurality of sensors. Further sensors could be used to, for example, determine the width of a body standing in the booth in order to take into account bodies that have a larger body circumference i.e, bodies that are larger in terms of weight.

25

The sensor may be any suitable type of sensor, but preferably the sensor comprises an ultrasonic sensor. Advantageously, the booth further

comprises movement means for effecting movement of the projecting means. Preferably, operation of the projection means is controlled by the control means.

- 5 Advantageously, the movement means effects vertical movement of the projecting means. This means that the height from which the product is projected may be varied both throughout the tanning operation, and also in response to the parameters of the body accommodated in the booth.
- 10 Advantageously, the movement means comprises at least one slider unit moveable vertically between two positions, the slider unit supporting the projecting means.

Preferably, the projecting means comprises at least one nozzle adapted to project the product.

Preferably, the projecting means comprises a plurality of nozzles each adapted to project the product. Through use of a plurality of nozzles, the product may be projected into at least some of the booth volume, and, in use onto a body of a person from a plurality of different projection points.

Advantageously, the booth further comprises adjustment means for adjusting the attitude of the nozzles. The adjustment means may be adapted to either adjust the attitude of the nozzles independently from one another, or to adjust the attitude of the nozzles so that all nozzles have the same attitude.

Advantageously, operation of the adjustment means is controlled by the control means.

Preferably, the projection means comprises a nozzle support defining a substantially arcuate shape, the nozzle being positioned to spray the product into an area defined by the nozzle support.

- 5 By means of the arcuate nozzle support, the product may be projected towards the centre of the booth into an area, where in use, a person will be accommodated.

The nozzle support may define a substantially circular shape or alternatively  
10 may define a semi-circular or other part-circular shape.

Preferably, the projecting means comprises one or more spray guns which are directed to spray product horizontally and/or at an angle to the horizontal (whether upwardly or downwardly, and/or some combination of  
15 these).

Alternatively, there is provided two or more slider units supporting an arcuate spray arm comprising a plurality of spray guns.

- 20 Preferably, the booth further comprises recirculating means for recirculating the air within the booth. The recirculating means comprises any suitable air moving device such as a fan.

Advantageously, the booth further comprises a filter. The filter filters out  
25 particles of the product circulating within the booth.

- The booth is preferably used to apply a cosmetic product to the skin of the user. The cosmetic product could be any of a range of products such as skin moisturisers, but preferably the cosmetic product is a sunless tanning  
30 product.

Advantageously, the flow means comprises a first plenum of positive pressure located in the top portion of the booth, and a second plenum of negative pressure that is located in the base portion of the booth. The first and second plenums therefore result in the downward flow of air from the first plenum towards the second plenum.

The downward airflow may be arranged to occupy a predetermined volume within the booth. A person occupying the booth may stand in this predetermined volume during and after the tanning process.

Advantageously, the predetermined volume comprises a portion only of the booth volume.

This means that, for example, a client may leave personal belongings in a portion of the booth situated outside of the predetermined volume, which belongings will therefore not be exposed to the particles of sunless tanning lotion.

The recirculating means is used to maintain the pressure differential between the first and second plenums and therefore contributes to the down flow of air within the booth.

Conveniently the first plenum pressurises air in excess of the ambient atmospheric pressure and the second plenum depressurises air to less than the ambient atmospheric pressure.

Advantageously the first and second plenums are connected to a duct in which the air recirculating means is located. The first and second plenums,

the duct, the recirculating means and the booth volume together form an air management system.

- Preferably the booth further comprises temperature means for controlling
- 5 the temperature of air circulating within the booth. The temperature means may comprise a heater which heats the air or alternatively may comprise a cooler which cools the air.

According to a second aspect of the present invention, there is provided a

10 control system for a booth having projecting means for projecting a product into a booth volume within the booth, the control system comprising operating means to operate the projecting means in selected regions of the booth volume.

- 15 Preferably, the control system operates the projecting means to project specified amounts of the product in selected regions of the booth volume, the specified amounts varying from zero to maximum flow of the product from the projecting means.
- 20 Preferably, the projecting means is movable along a path within the booth and the control system operates the projecting means as it moves along the path in accordance with predetermined instructions.

There is also provided a method of controlling operation of a booth having

25 projecting means for projecting a product into the booth volume within the booth, the method comprising operating the projecting means in selected regions of the booth volume.

There is also provided a computer program product directly loadable into

30 the internal memory of a digital computer, comprising software code

portions for performing the steps of the method when said product is run on a computer.

Preferably, the projecting means comprises a remotely operated tool.

5

According to a further aspect of the present invention there is provided a tool for projecting a product into a booth, the booth comprising a base portion and a top portion, flow means for causing a downward air flow within the booth, and control means for controlling the projection of the product.

10

In a preferred embodiment of the present invention, the projecting means comprises movement means to automatically move the tool to provide spraying between two zones in the booth. Preferably, the two zones comprise the entire height of the booth.

15

The spray guns may be directed to spray product horizontally and/or at an angle to the horizontal (whether upwardly or downwardly) and/or some combination of these.

20

According to a further aspect of the present invention there is provided a method of applying a product to a human body using a booth defining a booth volume and comprising the steps of:

25

sensing the height of a human body accommodated in the booth;

estimating one or more other parameters of the body based on the height;

projecting a product into the booth and therefore onto the body;

controlling the amount of product projected into predetermined zones in the booth in accordance with the height of the body.

30

By means of the present invention, it is possible to direct the product to a predetermined point within the booth, and therefore to a predetermined part 5 of a body standing in the booth. It is also possible to calculate accurately the amount of product required for different parts of the body.

By means of the present invention, therefore, because the control means is able to sense the height of a body standing in the booth, and then to 10 determine where other parts of the body are located relative to the base of the booth, the amount of product projected by the projecting means can be varied in order to ensure that appropriate amounts of product are directed to predetermined parts of the body.

15 Although the present invention has been described in terms of a booth, it would be possible to carry out the invention in an open environment. Similarly, it would be possible to carry out the invention within an area defined by the downward flow of air, which downward flow of air would ensure containment of the product within a predetermined volume.

20

The invention will now be further described by way of example only with reference to the accompanying drawings in which;

Figure 1 is a schematic representation of a booth according to a first aspect of the present invention;

25 Figure 2 is cross-sectional representation of the booth of Figure 1;

Figure 3a is a schematic representation of the booth of Figure 1 showing product being projected onto a person standing in the booth having a predetermined fluid projection distance;

Figure 3b & Figure 3c are schematic representations showing product being projected onto the person in the booth of Figure 1 having increasing fluid projection distances;

5 Figure 4 is a schematic representation showing how bodies of different heights may be accommodated within the booth;

Figure 5 is a schematic representation showing how a predetermined amount of product may be projected into a predetermined zone of the booth, thus, in use, applying more product to certain parts of the body in the booth;

10 Figure 6a and 6b are schematic representations showing the different positions taken by a body within the booth;

Figure 7 is a perspective part view of a slider unit forming part of the booth of Figure 1;

Figure 8 is a schematic representation showing in detail how a booth according to the invention would be operated; and

15 Figure 9 is a block diagram showing the components of a booth according to the present invention.

Referring to the figures, a booth according to the first aspect of the present invention is designated generally by the reference numeral 2. The booth defines a booth volume also known as a spray chamber 4 and comprises a base portion 6 and top portion 8. The booth 2 comprises an upper plenum 10, and a lower plenum 12. The upper plenum has a positive pressure with respect to atmospheric pressure, and the lower plenum has a negative pressure with respect to atmospheric pressure. This pressure difference causes a downward flow of air in direction of arrows 14 of air circulating within the booth 2. The booth 2 further comprises a duct 16 comprising an air mover 18 in the form of, for example, a fan (see Figure 2). The air mover 18 positioned in the duct 16 allows air to be recycled within the booth 2. The booth further comprises a filter 20, the purpose of which will be described further herein below.

The booth 2 further comprises projection means 22 comprising a spray ring 24 on which are mounted a plurality of spray guns, or nozzles 26. The spray ring 24 is mounted on a slide carriage 28 which allows vertical movement of the spray ring. The booth 2 further comprises a range sensor 30 mounted on the spray ring 24. The range sensor is used to detect the height of a person or client 32 standing the booth as will be described in more detail herein below.

10 The booth further comprises doors 34 which are moveable between a sealed positioned as shown by the solid lines in Figure 2, and an open position as shown by the broken lines in Figure 2.

15 The spray ring 24 on which the spray guns 26 are mounted, enables the guns 26 to be mounted in precise predetermined positions.

20 The spray ring is in turn mounted on the slide carriage 28. The slide carriage 28 enables the spray ring to reciprocate from the top of the spray chamber 4 to the bottom of the spray chamber. This enables the guns 26 mounted on the spray ring to be moveable along a predetermined distance which, for example, along the entire length of a client 32 having a maximum height of, for example, 6' 4". The slide carriage 28 is caused to reciprocate by way of an electrical motor (not shown) and is driven via any suitable drive shaft mechanism.

25 The spray guns deliver product into the spray chamber and cause the product to be atomised on entry into the spray chamber.

30 During the act of spraying, the tanning product becomes air borne in the form of small droplets. The downward airflow of the present invention ensures that these small droplets are kept away from the client and that a

clean supply of air for both the operator and the client is available. The filter 20 serves to filter out particles of the product to ensure that the recirculating air is as clean as possible.

5 A percentage of the air flow is bled off from the first plenum 10 in order that the differential between the air volume being drawn from the booth volume 4 into the second plenum and the air volume being moved into the booth volume 4 from the first plenum 10 is replaced by air movement into the downward flow of air within the booth volume. This management of the  
10 air flow prevents any outward flow of particles from the booth volume 4 during the spraying process and ensures that all particles generated within the booth volume 4 must pass through the filter 20 thus ensuring that the client is maintained in clean air.

15 A downward flow of air is the most efficient way to move air over a human body as moving air downwards over a body ensures that the body presents a minimum cross sectional area of impedance to the air flow.

The downward air flow capitalises on the tendency for heavy atomised  
20 particles to drop downwards under the influence of gravity. The downward airflow thus uses gravity to assist in the process of extracting particles generated by the spraying tool from the booth volume 4.

Since air is recycled within the booth 2, it will not be necessary for a  
25 purchaser of the booth 2 to carry out building work to their premises in order to create ductwork to the atmosphere. By using a recirculating air stream there is no need for any building work to be carried out since no ductwork to the atmosphere is required.

The booth 2 further comprises a heater 34 which warms the air in the downward airflow. The combination of spraying a wet product onto a client's skin in conjunction with an air stream moving over the body of a client creates a "chill factor". By means of the heater 26 it is possible to  
5 ensure that air passing over the body of a client is at an appropriate temperature. Further, after the spraying process has been completed, a client may be dried by the airflow.

Although the invention as hitherto been described with reference to a  
10 heating apparatus for heating the air flowing through the booth, it is envisaged that in warmer climates or during the summer of temperate climates it may be advantageous to cool the air flow.

The fan 18 causes the air within the recirculated down draught extract  
15 system (indicated by arrows 14 in Figure 1) to be moved within the booth. The speed at which the fan is caused to run influences how much air volume is moved through the fixed volume of the air management system, therefore influencing the speed of the air moving downward within the spray chamber.

20

The range sensor 30 is able to detect the position of features on the client's body such as the top of the head of the client's body. The sensor works by "seeing" only within a certain range. In the present embodiment the range of the sensor is 700mm. It will sense anything within this range. At this  
25 range the sensor will sense only what is actually inside the spray chamber and not, for example, the inside of the doors should they be closed. A client stands within the range of the sensor when inside the spray chamber thus enabling the range sensor to detect the top of the client's head.

The booth 2 further comprises filtered constant bleed sites 36 for ensuring that the pressure does not build up within the booth. These bleed sites ensure that the pressure differentials within the two plenums obey the following rule in order to ensure that there is no possibility of atomised product leaving the spray chamber other than through the filtration system:

5 Overpressure in upper chamber – one atmosphere = X  
Underpressure in lower chamber – one atmosphere = Y

With the effect of the bleed sites, Y is always greater than X thus causing an  
10 IN-flow of air through any leak sites within the spray chamber itself, thus ensuring that no atomised product can leave the spray chamber other than via the filter systems.

The booth 2 further comprises a control system 90 which can take any  
15 suitable form, but in this embodiment comprises electrical and electronic components which are run by real time embedded software. The control system controls the general operation of the booth 2, and all of the variable parameters within the system. The control system is able to self-teach. This means that once the sensor has sensed the height of a person standing the  
20 booth 2, the control system is able to work out the necessary parameters for controlling projection of product into the booth 2. The control system is able to work out how to appropriately control the projection of product into the booth by initially working out where different parts of the body are located relative to the base of the booth, based on the known proportions of  
25 an average human body. The control system is then able to work out variables such as the speed of the fan, speed of movement of the spray ring along the slide carriage 28, and timings for switching on and off the spray guns in order to apply product appropriately to the person standing in the booth. For each cycle of the booth, these parameters are calculated again,

and in this embodiment are not stored in the memory within the control system.

The particular settings calculated by the control system 90 are known as a  
5 profile parameter set.

In use, a person requiring product such as a self-tanning product to be applied to her skin, enters the booth 2. Once the client 32 is within the booth, the doors 34 are closed in order to create a sealed environment. The client 32 is instructed for the sake of simplicity, to place her feet on fixed  
10 plates 36 located on the floor of the booth 2. This ensures that the client is standing in a repeatable position during the operation of the booth. Once the client is in position, the range sensor 30 senses the height of the top of the client's head. Once the height of the top of the client's head has been sensed, all other relevant points on the client's body can be deduced with  
15 sufficient precision by calculating the position of these parts of the body as percentages of the client's height. These percentages are based on mean averages of data taken from a large number of individuals. The sensor 30 detects the height of the client by reciprocating from the top of the spray chamber towards the bottom along the slide carriage 28. It is not necessary  
20 for the sensor to reciprocate along the entire length inside the spray chamber. It is necessary only for the sensor to reciprocate downward until a signal is emitted from the sensor when it determines the presence of the top of the client's head. Once this information has been gathered, the slide carriage 28 returns the spray ring to the position which is appropriate to  
25 start the profile parameter set for which it has just gathered the information. All profile parameter sets start at a fixed dimension over the client's head. For example should the client be 1700mm tall then the slide will proceed downward from the "home" position in which it rests, (the uppermost reach of its stroke) until the signal is gained from the sensor i.e. at 1700mm. It  
30 will then slow down and stop in a controlled manner, whereupon it will

reciprocate upwards to the first point in the profile parameter set created for that client. The profile parameter sets start the spraying operation 50mm above the top of the client's head. Therefore in this case, the slide would return upward to a point which places the gun nozzles at a height of  
5 1750mm. This is the point at which this particular profile parameter set would cause the application of product to be started. However, if the sensor or sensors are used in a more detailed manner i.e. to sense further information regarding the client's body, the slide carriage 28 may be required to reciprocate the slide all the way to the bottom of the spray  
10 chamber.

Once the height of the client has been determined, the profile parameter set is created. This is a set of instructions issued by the control system to the components of the spray booth system in order to achieve application of the  
15 product as dictated by the information gathered and processed. Once the profile parameter sets has been created, the projection means are able to project product into predetermined zones within the booth so that the application of product onto the client is optimised.

- 20 Other information which is deducible from the height of the client is the approximate position of the upper and lower body, divided at the hip line. This enables the system to be able to carry out partial body tans correctly sized to the client's body. Clearly a 6' tall person would have a hip line in a very different position relative to the base of the booth than a 5' tall person.  
25 By means of the present invention it is possible to offer partial body tans, either upper or lower, to clients since it is possible to determine where the hip line of a particular client is relative to the base of the booth.

30 The control system controls the speed of the slide carriage 28, the guns switching positions and the fan speed.

By controlling the speed of the slide carriage, the amount of product projected into predetermined zones in the booth and therefore deposited onto particularly areas of the client's body by the guns 26 is determined.

- 5      The guns are preset to deliver a known quantity of product per second. Therefore, if the slide carriage moves more quickly through its reciprocating stroke, or part of its stroke, then the area of the body which is to be sprayed at that part of the stroke will receive less product. This is because the guns pass more quickly over a particular part of the body when
- 10     the slide carriage is moving more quickly, and *vice versa*.

The positions within the stroke of the slide carriage at which the guns are switched on and off, i.e., the times at which they are spraying and not spraying are also controlled by the control system.

- 15     Controlling the speed of the fan causes a greater or lesser volume of air to be moved per second through the finite volume of the booth 2. Therefore if the fan speed is increased, a greater volume of air will be recirculated per second within the booth. This causes an increase in the speed of downward extracting airflow within the spray chamber. This in turn increases the airflow speed within the spray chamber and causes the fluid projection distance to be decreased (see Figures 3a, 3b and 3c). By decreasing the fluid projection distance to an approximate equivalent to the distance between the client and the guns, it is possible to cause a greater deposition
- 20     of product onto predetermined areas of the client, for example, onto the tops of the client's shoulders, therefore causing a higher degree of realism to the completed tan (see, for example, Figure 5). In addition, deposition of the
- 25     product into difficult to reach areas such as the client's inner thighs can be enhanced by being able to increase the fluid projection distance at this point
- 30     on the body.

Control of the fan speed can also be beneficial in dealing with a problem caused by the client facing one way and then the other. The client is instructed to stand first facing one way and then to turn through approximately 180° to stand in an opposite direction. However, when the client presents the rear of her lower leg to the spray ring (as shown in Figures 6a and 6b), the lower leg is positioned closer to the spray ring than when she present the front of her lower leg to the spray ring. This is due to the shape of the human foot and where the lower leg intersects with the foot. By controlling the fluid projection it is possible to ensure that the coating is approximately identical on both the front lower leg and the back lower leg.

In an alternative embodiment, the spray ring is mounted for horizontal, as well as vertical movement. This means that the spray ring may be moved relative to the client in order to apply product to the back of the client. This obviates the need for the client to move through 180°.

In cases, where an operator of the booth will offer partial body tans to clients, it is commercially necessary to ensure that a client is not able to select a full body tan even though they have only paid for a partial body tan. In order to ensure that the client cannot select a full body tan when only paying for a partial body tan, the client can be issued with a small plug-in item. Within this item is an EPROM chip. This chip carries the necessary instruction to the control system to ensure that it carries out the relevant treatment. When inserted into the spray booth system, the EPROM chip carried in the device will ensure that the client will receive only the treatment that they have purchased. Once the plug in device is inserted, the control system will be alerted that the client is ready to proceed and will commence the body scan to determine the height of the client. If a client chooses to have a partial body tan, for example of her legs only, then the

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control system will calculate a position of the top of the client's legs and will begin the spraying process at this height.

In this embodiment of the invention, the spray ring will continue to move  
5 along the entire stroke of the slide carriage, but the control system will activate the guns at the appropriate point to apply product to the legs only of the client.

However, in other embodiments, the spray ring may travel up to the  
10 appropriate point only and will not carry on to complete the entire stroke of the slide carriage.

Because the booth according to the present invention is able to detect the height of a client, the application of product is more efficient and there is  
15 less waste since an appropriate amount of product may be applied in accordance with the height of the client.

Further, in the case of shorter clients, the product will be sprayed at an appropriate height relative to the head of the client, which will reduce the  
20 possibility that the client will inhale the product. In prior art booths, where the height of the client cannot be taken into account, an unnecessarily long period of time may be spent on applying product to the client's face.

By means of the present invention, however, since it is possible to detect  
25 where the client's head is located, only sufficient product to apply the product to the face will be projected onto the face of the client, thus reducing the amount of product that the client could inhale.

Further, by means of the present invention, it is possible to apply different  
30 amounts of product to different parts of a client's body. The inventors have

determined that certain areas of the body are capable of absorbing more product than others before excess application occurs. Excess application is undesirable as this causes the product to run off the skin leaving streaks in the finished application and therefore the tan. By being aware of the 5 locations of various parts of the body that require differing amounts of product, and applying the product accordingly, the disadvantages of excess product application are minimised.

10 The resulting tan is more realistic because certain parts of the body, for example, the shoulders can be given a darker tan which is consistent to the effect of a natural tan.

15 By means of the present invention therefore a highly specific and controlled delivery of atomised products such as a sunless tanning product may be applied to the client. There is no need for the client to manually manipulate the product once it has been applied to the skin in order to ensure even coverage.

20 There is shown in Figure 7 details of a spray ring 50 suitable for use in booth 2.

25 The interior of booth 2 contains a slide unit 52 which supports a spray arm 54 to provide vertical upward and downward movement of arm 54 over the entire height of the booth. In other embodiments, there may be a plurality of slide units.

Spray arm 54 comprises a horizontal arcuate arm containing a plurality of spray guns 55 to direct tanning lotion inwardly and horizontally generally towards the centre of arm 54 and hence onto any occupant of the booth.

Thus, spray arm 54 can be shaped to form an arc of from 0° to 360°. However, in this embodiment the arc as measured between the two outermost guns is 85°. The spray guns may extend along the entire 5 periphery of the arm.

- The spray guns are positioned so as to direct the lotion horizontally. In a variant, they may be positioned to direct the lotion at a small angle inclined 10 to the horizontal. In another variant, the guns may be positioned to direct the lotion at various different angles either upwardly or downwardly, and either in a random manner or in an organised, progressively changing manner.
- 15 Spraying mechanism 50 also has a motor 57 and a gearbox 58 to provide the vertical motion of slide units 52, 53.

The "open" configuration of spray arm 54, has been developed with safety in mind. The spray arm 54 allows client access in from one side, regardless 20 of the position within the spray chamber and it enables a quick exit in case emergency procedures need to be followed. It also allows for a quick exit if the client, for whatever reason, feels uncomfortable with the process. If movement of the spray arm 54 is halted at any position during its travel, the client is still able to exit the booth with minimal discomfort or danger.

25 In order to spray the client over the whole body using this design of spray arm 54, the application of tanning lotion must be applied in two steps. In the first step the front section of the body is sprayed; the client then turns through 180 degrees, and actuates operation of the spray arm 54 again,

thereby applying lotion to the rear section of the body. Multiple spray guns would only be seen on one section the spray arm.

Alternative designs may allow for pneumatically actuated slide systems, but  
5 they tend to lack precise speed control, acceleration and deceleration parameters as compared to the programmable, electrically driven slide system.

The drive system is based on a servo motor 56 arrangement, allowing for  
10 the programmable switching of the spray guns according to the different requirements of the client. Alternative drive solutions include stepper motor control, AC and DC stepper motors.

The spray ring 50 further comprises a flexible coupling 58 which connects  
15 the servo motor to the slide carriage 52. The spray ring 50 also comprises an encoder for enabling the spray ring to be programmed by the control system.

The spray ring 50 further comprises a carriage home position sensor 60  
20 which senses when the spray ring has reached its maximum height, and an over travel safety switch 61 which would cut off power to the spray ring in the event that it travelled beyond its maximum height.

In addition to the drive motor arrangement, the rate of rotation is reduced  
25 using a gearbox arrangement 57. This provides a higher torque, required to overcome the weight of the spray arm 54 and actually allows for more precise positioning of the slide systems.

In order to keep the doors closed, a magnetic latch system is used. This  
30 allows the doors to stay closed against the spring-loaded "opening" system,

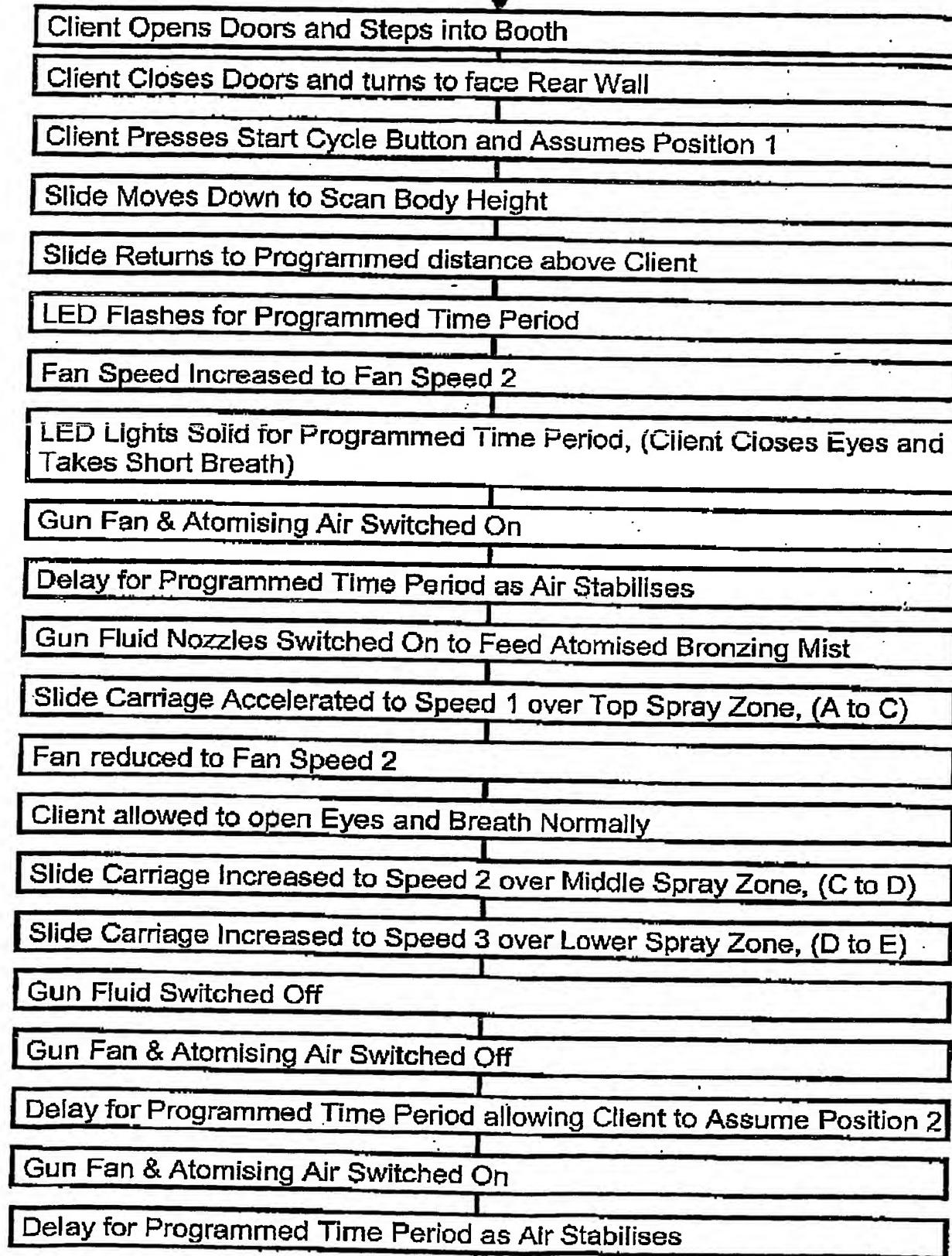
but also allows for manual release of the doors should an emergency procedure arise, requiring the client to exit the booth. If a power cut experienced, the doors are automatically opened by default, immediately providing a clear exit for the client.

5

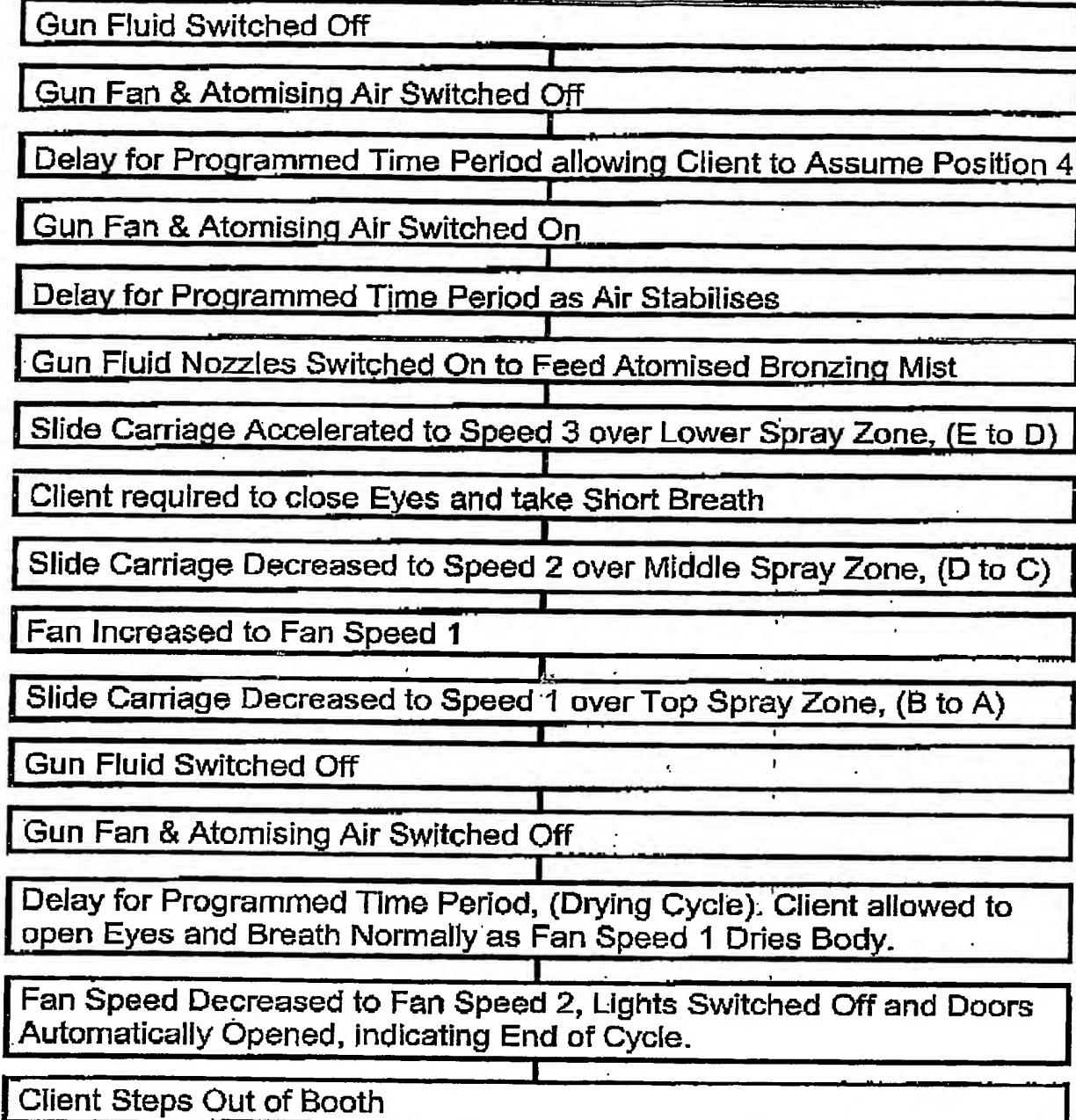
Turning now to Figure 8, the operation of a booth according to the present invention is described in more detail.

Set out below is process flow chart and sequence of operations describing  
10 the operation of the booth 2 with reference to Figure 8.

## Process Flow Chart



- ↓
- Gun Fluid Nozzles Switched On to Feed Atomised Bronzing Mist
- Slide Carriage Accelerated to Speed 3 over Lower Spray Zone, (E to D)
- Client required to close Eyes and take Short Breath
- Slide Carriage Decreased to Speed 2 over Middle Spray Zone, (D to C)
- Fan Increased to Fan Speed 1
- Slide Carriage Decreased to Speed 1 over Top Spray Zone, (B to A)
- Gun Fluid Switched Off
- Gun Fan & Atomising Air Switched Off
- Delay for Programmed Time Period allowing Client to turn around through 180° and Assume Position 3. Client allowed to open Eyes and Breath Normally.
- LED Flashes for Programmed Time Period during Previous Step
- Fan Speed Remains at Fan Speed 2
- LED Lights Solid for Programmed Time Period, (Client Closes Eyes and Takes Short Breath)
- Gun Fan & Atomising Air Switched On
- Delay for Programmed Time Period as Air Stabilises
- Gun Fluid Nozzles Switched On to Feed Atomised Bronzing Mist
- Slide Carriage Accelerated to Speed 1 over Top Spray Zone, (A to C)
- Fan reduced to Fan Speed 2
- Client allowed to open Eyes and Breath Normally
- Slide Carriage Increased to Speed 2 over Middle Spray Zone, (C to D)
- Slide Carriage Increased to Speed 3 over Lower Spray Zone, (D to E)
- ↓



## Inputs / Outputs

### INPUTS

1. Booth Controller Ok
2. Home Switch
3. End Switch
4. Height Sensor

### Outputs

1. Start Cycle
2. Start Fans High / Low, (2 speeds)
3. Start LED
4. Start Air (on / off)
5. Start Guns (on / off)

### VARIABLES

1. Speed 1 (A to C)
2. Speed 2 (C to D)
3. Speed 3 (D to E)
4. Move 1 (A to B)
5. Move 2 (B to C)
6. Move 3 (C to D)
7. Move 4 (D to E)
8. Accel 1
9. ALL Timers

SEQUENCE OF OPERATION

1. Set Output 1
  - Start Cycle
2. Jog
3. Input 1
4. If
  - Height Sensor Position (variable)
  - Height Sensor < 50mm Move up to S/ware Home
  - Height Sensor > 50mm, Move up 50mm
5. Else
6. Output 2
  - Start Fans High
7. Output 3
  - Start LED – Flash 5 Seconds – Continuous after
8. Output 4
  - Turn Air On
9. Timer
  - 1 second (variable)
10. Output 5
  - Turn Guns On
11. Move Speed 1
  - Distance 350mm (A to C)
12. Output 2
  - Start Fans Low at Position C
13. Accel
  - Accel to Speed 2
14. Move Speed 2
  - Distance 400mm (C to D)
15. Accel
  - Accel to Speed 3
16. Move Speed 3
  - Distance 700mm (D to E)
17. Output 5
  - Turn Guns Off
18. Decel
  - 50mm to Position E
19. Output 4
  - Air Off
20. Timer
  - Delay 3 seconds
21. Output 4
  - Air On
22. Accel
  - From Position E to -50mm
23. Output 5
  - Turn Guns On
24. Repeat
  - Repeat Cycle in Reverse to Line 11
25. Output 5
  - Guns Off @ Position A
26. Timer
  - Delay 1 second
27. Output 4
  - Air Off
28. Output 3
  - LED Flashes for 10 seconds (Client turns round)
29. Loop 1
  - Loop Back to Line 6 and repeat to Line 27
30. Output 3
  - LED Flash for 2 Minutes
31. Timer
  - Delay 2 Minutes
32. Output 2
  - Fans Switch to Low Speed
33. Output 1
  - Cycle Off

Turing now to Figure 9, a block diagram showing the components of the booth 2 is illustrated. The booth 2 comprises a control system 90 which controls the various components forming the booth 2. In particular, the booth 2 comprises a closed loop air heating system 92 and a spray chamber 5 lighting system 94. An AC inverter drive system 96 is used to power the fan 36. Movement of the spray ring is controlled by the slide carriage servo motor 56 which in turn is controlled by a DC closed loop motion controller 98. If an EPROM chip is use, then an EPROM tag management system 100 is also controlled by the control system 90. The booth further comprises an 10 internal LCD multi-media display 110 which allows the client positioned within the booth to see the settings of the booth 2, and an external alpha numeric display 120 which allows an operator to monitor the spraying operation. The control system 90 is run in conjunction with a Windows embedded PC system 130.

15

## CLAIMS

1. A booth for accommodating a person, the booth defining a booth volume and comprising:
  - 5 a base portion and a top portion;
  - flow means for causing a downward airflow within the booth; and
  - projecting means for projecting product into at least some of the booth volume within the booth and, in use, onto a body of a person positioned in the booth, and control means for controlling the projection of
  - 10 the product.
2. A booth according to Claim 1 wherein the control means control the projection of the product according to parameters of the body of the person.
- 15 3. A booth according to Claim 1 or Claim 2 wherein the control means comprises a sensor for sensing a parameter of the body.
4. A booth according to Claim 3 wherein the sensor senses the height of the body.
- 20 5. A booth according to Claim 3 or Claim 4 wherein the sensor comprises an infra-red sensor.
6. A booth according to any one of the preceding claims further comprising movement means for effecting movement of the projecting means.
- 25 7. A booth according to Claim 6 wherein operation of the movement means is controlled by the control means.

8. A booth according to Claim 6 or Claim 7 wherein the movement means effects vertical movement of the projecting means.
- 5 9. A booth according to Claim 8 wherein the movement means comprises at least one slider unit moveable vertically between two positions, the slider unit supporting the projecting means.
- 10 10. A booth according to any one of the preceding claims wherein the projecting means comprises a plurality of nozzles adapted to project the product.
- 15 11. A booth according to Claim 20 further comprising adjustment means for adjusting the attitude of the nozzles.
12. A booth according to Claim 11 wherein operation of the adjustment means is controlled by the control means.
- 20 13. A booth according to any one of Claims 10 to 12 wherein the projection means comprises a nozzle support defining a substantially arcuate shape, the nozzles being positioned to spray the product into an area defined by the nozzle support.
- 25 14. A booth according to any preceding claim wherein the projecting means comprises spray guns which are directed to spray product horizontally and/or at an angle to the horizontal (whether upwardly or downwardly) and/or some combination of these.

15. A booth according to any one of the preceding claims further comprising recirculating means for recirculating the air within the booth.

16. A booth according to Claim 15 wherein the operation of the recirculating means is controlled by the control means.

10 17. A booth according to Claim 15 or Claim 16 wherein the recirculating means comprises a fan.

18. A booth according to any one of Claims 15 to 17 wherein the recirculating means comprises a filter.

15

19. A booth according to any one of the preceding claims wherein the product comprises a cosmetic product.

20. A booth according to any one of the preceding claims wherein the cosmetic product is a sunless tanning product.

25 21. A booth according to any one of the preceding claims wherein the flow means comprises a first plenum of positive pressure located in the top portion of the booth, and a second plenum of negative pressure located in the base of the booth.

22. A booth according to any one of the preceding claims wherein the downward air flow occupies a predetermined volume within the booth.

23. A booth according to Claim 22 wherein the predetermined volume comprises a portion of the booth volume.

5

24. A booth according to any one of the preceding claims further comprising temperature means for controlling the temperature of the air.

10 25. A booth according to Claim 24 wherein the temperature means heats the air.

26. A booth according to Claim 24 wherein the temperature means cools the air.

15 27. A booth according to any one of the preceding claims wherein the projecting means comprises a remotely operable tool.

20 28. A control system for a booth having projecting means for projecting a product onto the booth volume within the booth, the control system comprising operating means to operate the projecting means in selected regions of the booth volume.

25 29. A control system according to Claim 28 wherein the system is operable on the projecting means to project specified amounts of the product in selected regions of the booth volume, the specified amounts varying from zero to maximum flow of the product from the projecting means.

30. A control system according to Claim 28 or 29 wherein the control system is operable on the projecting means to be movable along a path within the booth and the control system operates the projecting means as it moves along the path in accordance with predetermined instructions.

5

31. A control system according to any one of Claims 28 to 30 wherein the operating means operates the recirculation means.

32. A method for applying a product to a human body using a booth as  
10 claimed in any one of Claims 1 to 27.

33. A method of applying a product to a human body using a booth defining a booth volume and comprising the steps of:

15           sensing the height of a human body accommodated in the booth;  
              estimating one or more other parameters of the body based on the height;  
              projecting a product into the booth and therefore onto the body;  
              controlling the amount of product projected into predetermined zones in the booth in accordance with the height of the body.

20

34. A method of controlling operation of a booth having projecting means for projecting a product onto the booth volume within the booth, the method comprising operating the projecting means in selected regions of the booth volume.

25

35. A computer program product directly loadable into the internal memory of a digital computer, comprising software code portions for performing the steps of the method of Claim 34 when said product is run on a computer.

36. A booth substantially as herein before described with reference to  
and/or as shown in any one or more of the Figures in the accompanying  
drawings.

37. A method substantially as herein before described with reference to  
and/or as shown in anyone or more of the Figures in the accompanying  
drawings.

## TANNING BOOTH

### ABSTRACT

A booth for accommodating a person, the booth defining a booth volume  
5 and comprising:

- a base portion and a top portion;
- flow means for causing a downward airflow within the booth; and
- projecting means for projecting product into at least some of the  
booth volume within the booth and, in use, onto a body of a person  
10 positioned in the booth, and control means for controlling the projection of  
the product.

Figure 1

PCT Application  
**PCT/GB2004/000472**

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